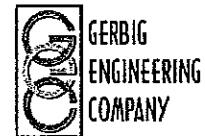


CERTIFICATION  
SERVICES  
FOR

## GERBIG ENGINEERING

Burnsville, MN

Laboratory Cleanroom  
Certification



*November 30, 2006*  
GERBIG ENGINEERING COMPANY  
1178 E. Cliff Road.  
Burnsville, MN 55337



GERBIG ENGINEERING

SERVICES

SINCE 1985

CERTIFICATION

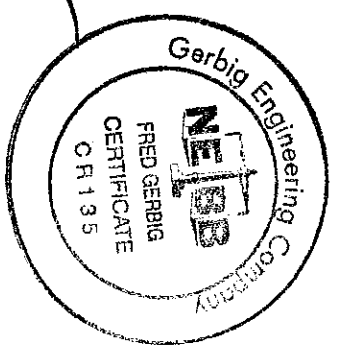
# Certificate of Compliance

*awarded to*

**Gerbig Engineering**  
Burnsville, Minnesota  
*Laboratory*

MEETS OR EXCEEDS THE REQUIREMENTS OF ISO 14644-1:1999 CLASS 8  
(FEDERAL STANDARD 209E CLASS 100,000)  
AT 0.5 MICRON IN THE AT-REST MODE

*presented by*  
**Gerbig Engineering Company**  
**November 30, 2006**



*Handwritten signature of Carl Sathrum*

*Carl Sathrum* *Cleanroom Certification*

*Handwritten signature of Mike Turnure*

*Mike Turnure* *Validation Director*

**NEBB CLEANROOM PERFORMANCE TEST AND CERTIFICATION**

Certification Date: November 30, 2006  
 Previous Certification Date: November 8, 2005

Gerbig Engineering  
 1178 East Cliff Road  
 Burnsville, MN 55337

**CLEANROOM DESCRIPTION**

Laboratory Cleanroom

**ROOM STATUS**

At-Rest

**CLASS**

ISO 14644-1 CLASS 8  
 (Fed Std 209E 100,000)

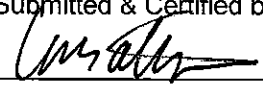
The data presented in this report is an exact record of cleanroom and cleanroom system performance and was obtained in accordance with NEBB standard procedures. Any variances from design quantities, which exceed NEBB tolerances, are noted throughout this report.

The cleanroom and cleanroom systems have been tested and final adjustments have been made in accordance with NEBB "Procedural Standards For Certified Testing of Cleanrooms" and the project specifications. NEBB certified cleanroom performance testing contractor: Gerbig Engineering Company, 1178 E. Cliff Road, Burnsville, MN 55337.

The results shown and information given in this report are certified to be accurate and complete to the extent possible by equipment and procedures used on this date.

Gerbig Engineering Company warrants that the above referenced clean rooms have been tested and meets or exceed the stated class conditions in accordance with ISO 14644-1:1999, Institute of Environmental Sciences RP-CC006.2-1993 and RP-CC034.1-1999, and/or the National Environmental Balancing Bureau Procedural Standards for Certified Testing of Cleanrooms, and makes no other warranties, stated or implied, concerning the continued performance, operation or safety in use of this equipment past this time.

Submitted & Certified by:

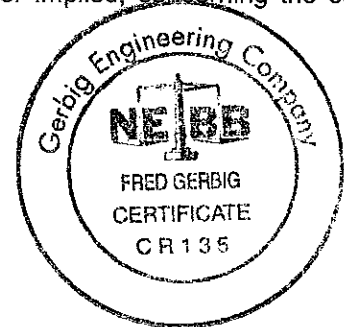
  
 Carl B. Sathrum  
 Validation Specialist

15 DEC 06  
 Date

Reviewed by:

  
 Michael H. Turnure  
 Sr. Validation Specialist

12 DEC 2006  
 Date



NEBB Cleanroom Performance Testing  
 Reg. No. CR135, Date of Reg. 9/1/1998

**ENGINEERING & CONTAMINATION CONTROL**



GERBIG  
 ENGINEERING  
 COMPANY

MODULAR WALL CLEANROOMS

MINI ENVIRONMENTS & SOFTHALLS

CLEAN WORKSTATIONS & WARDROBES

CLEANROOM ENGINEERING & DESIGN

FACILITY & EQUIPMENT VALIDATION

1178 E Cliff Rd, Burnsville, MN 55337

952-960-4400 952-960-4410



Date:

Title:

Project:

View:

www.airecell.com

# SUMMARY OF TEST RESULTS

**Gerbig Engineering**

**Lab Cleanroom**

**November 30, 2006**

On November 30, 2006 Gerbig Engineering Company certified the Lab Cleanroom located at Gerbig Engineering Company in Burnsville, MN. Testing included *HEPA filter leak testing, airflow velocity and uniformity measurements*, room pressure differential testing, and *particle counting*. Certification to ISO 14644-1(1999) Class 8 (Federal Standard 209E Class 100,000) clean room was achieved for the Lab Cleanroom.

## **HEPA Filter Leak Testing**

The HEPA filter was scanned for leakage through the filter media and checked for bypass leakage around the filter edges. The HEPA filter tested free of leaks. A drawing describing HEPA filter location and leak status follows in this report.

## **Airflow Velocity, and Air Changes Per Hour**

HEPA filter airflow velocity was measured using a Shortridge ADM-870 Airdata Multimeter and Velgrid attachment. Air flow velocity data was used to calculate room air changes per hour. Data -- including airflow velocities, volumes, and air changes per hour -- can be found in the test report forms and drawings that follow.

## **Room Pressure Differentials**

Room Pressure differentials and airflow directions were measured using a Shortridge ADM-870 airdata multimeter. Results are recorded to the nearest .01 inches of water column ("wc) and can be found in the attached drawing.

## **Particle Counts and Locations**

The quantity of particle count locations was determined, for the clean zone, as a function of the room square footage. Sample locations were chosen utilizing a grid pattern; and sampling was performed at working level (42" above floor). Certification to ISO 14644-1 Class 8 was achieved for the Gerbig Lab Cleanroom. A cleanliness level calculation report and sample location drawing are included in this report.

## **Equipment Calibration**

All applicable test equipment is calibrated to NIST-traceable standards. Copies of equipment calibrations can be found at the end of this report.

Gerbig Engineering Co.  
1178 E. Cliff Rd  
Burnsville, MN 55337

### ISO 14644-1 CALCULATION FOR CLEANLINESS LEVEL

CLEAN ZONE TESTED: GERBIG LAB

Airflow Type:	(Unidirectional)	Test mode was:	Operational
	X (Non-unidirectional)	Sample Locations:	3
Room Size square feet:	100	Particle Size:	0.5 $\mu$
Cleanliness Class:	ISO 8		

### Clean Zone GERBIG LAB Meets ISO 14644-1 Class 8 Requirements For Certification At 0.5 Micron For Data Collected on November 30, 2006

#### Statistical Classification Criteria

	per ft <sup>3</sup> (F.S. 209E)	per m <sup>3</sup> (ISO)
Mean of the Averages:	5,098	180,022
Standard Deviation:	1,748	61,709
Standard Error:	1,009	35,628

#### Acceptance Criteria

	per ft <sup>3</sup> (F.S. 209E)	per m <sup>3</sup> (ISO)
Highest Average at a Location:	7,105	250,878
Highest Average Allowed:	100,000	3,530,000
95% Upper Confidence Limit:	8,045	284,056
Allowable Limit:	100,000	3,530,000

#### Optional Information

Average Temperature (F):	NA
Average Humidity (RH):	NA



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Burnsville, MN 55337

RAW DATA AND AVERAGES FOR ISO 14644-1 CLASS 8 CALCULATION

Clean Zone Tested:	GERBIG LAB	Sample Locations:	3
Test Mode:	Operational	Particle Size:	0.5 $\mu$

Particle Counts Sampled On November 30, 2006

Location	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Total	Average per ft <sup>3</sup>	Average per m <sup>3</sup>	Optional Data
1	5,740	2,820				8,560	<b>4,280</b>	<b>151,127</b>	
2	3,950	3,870				7,820	<b>3,910</b>	<b>138,062</b>	
3	7,890	6,320				14,210	<b>7,105</b>	<b>250,878</b>	

GERBIG ENGINEERING  
1178 East Cliff Road  
Burnsville, MN 55337

## HEPA FILTER VELOCITY AND VOLUME TEST REPORT

CLEAN ZONE TESTED: GERBIG LAB

TEST DATE: 11/30/2006

Air System Number:	NA
Specified Air Flow to Room:	650 CFM
Allowable Bound:	20%
Number of Filters:	1

### SUMMARY OF COLLECTED DATA

#### Uniformity Test Based on Collected Data and Resulting Averages

Average Air Velocity:	135.0 FPM
Number of Readings:	2
Standard Deviation Of All Readings:	8.5 FPM
Relative Standard Deviation (Std.Dev./Avg.Velocity):	6.3%

#### Comparison To Specified Data

Specified Airflow:	650 CFM
Total Measured Airflow:	981 CFM
Percent of Specified Airflow:	151%
Number of Readings: 2	
Below Limit:	0
Within Limit:	2
Above Limit:	0
Percent of Readings within Allowable Bound:	100%

#### Room Air Changes Per Hour

Volume of Room (ft <sup>3</sup> ):	1,008.0
Volume of Air into Room per Minute (cfm):	980.9
Air Changes Per Hour:	58.4



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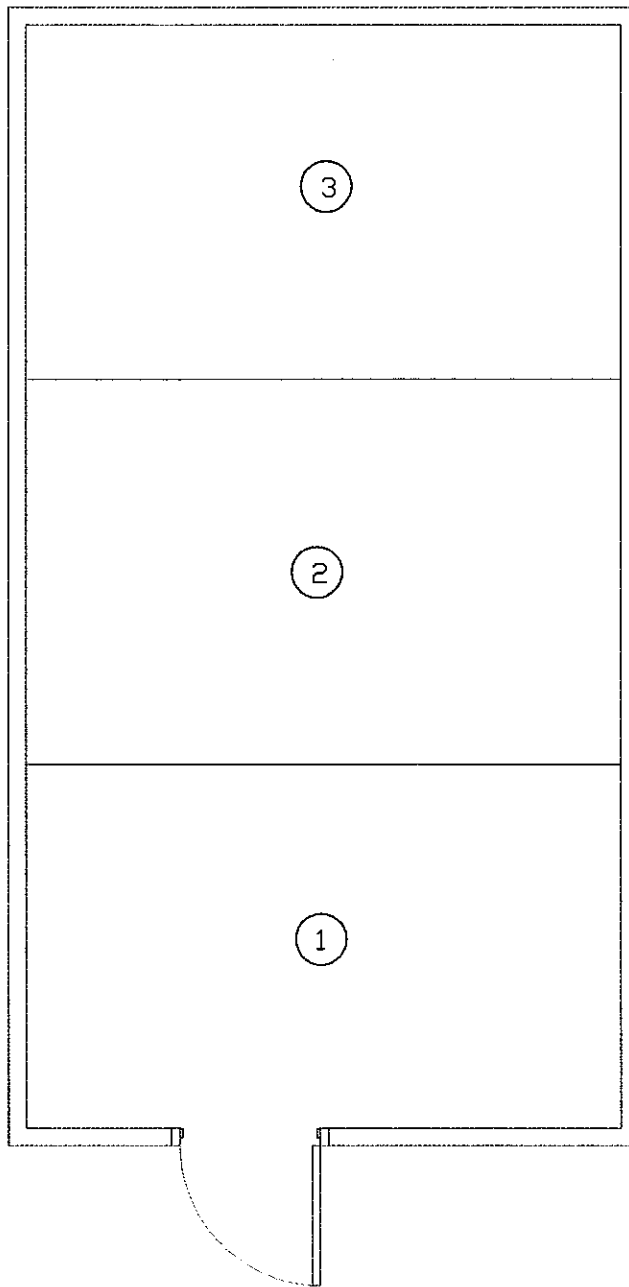
**GERBIG ENGINEERING**  
**1178 East Cliff Road**  
**Burnsville, MN 55337**

**HEPA FILTER VELOCITY AND UNIFORMITY DATA AND RESULTING AVERAGES**

Specified Airflow to Room:	650 CFM	No. of Readings:	2
Specified Lin Velocity:	89 LFM	High Counts:	0
Average Measured Room Air Velocity:	135.0	Low Counts:	0
Lower Velocity Bound:	108.0	% Within Range:	100.0%
Upper Velocity Bound:	162.0	Name of Zone:	<b>GERBIG LAB</b>
Blank Space Data Points:	6	Date of Test:	<b>30-Nov-06</b>
Standard Deviation:	8.5		
Relative Standard Deviation:	6.3%		

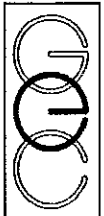
Filter No.	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	Reading 7	Reading 8	Filter Avg LFM	Filter CFM
1	141	129							135.0	980.9
									Airflow=	980.9

# PARTICLE COUNT LOCATIONS



**LEGEND**  
— =LOCATION GRID  
② =LOCATION NUMBER

CERTIFICATION SERVICES



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**NOTE:**

SAMPLE AT 0.5 MICRON  
SAMPLES TAKEN AT 42" ABOVE THE  
FLOOR UNLESS OTHERWISE INDICATED

GERBIG LAB

1178 East Cliff Road  
Burnsville, MN 55337

Cleanroom Planning and Design

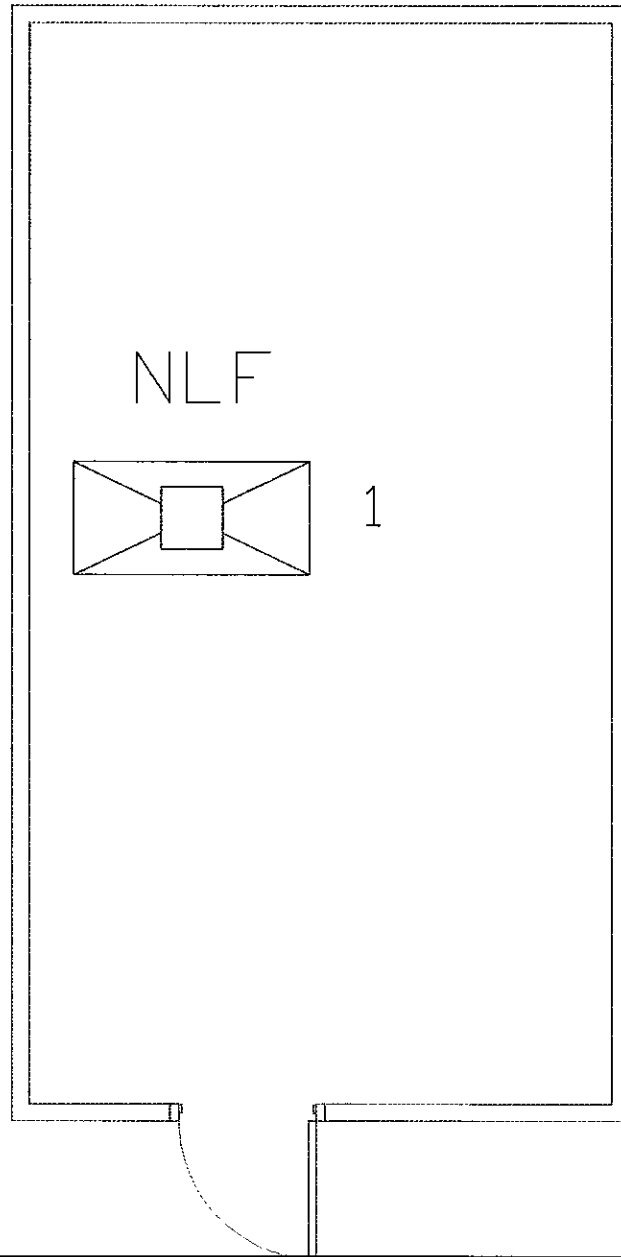
BURNSVILLE, MN 55337  
PHONE: (952) 960-4410  
FAX: (952) 960-4400

DATE TESTED: NOVEMBER 30, 2006


TECHNICIAN(S): CARL SATHRUM

-- DRAWING NOT TO SCALE --

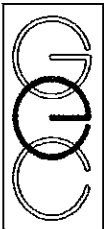
# HEPA FILTER LEAK TEST



## LEGEND

	=HEPA FILTER	FAIL	=FILTER FAILED
1	=FILTER NUMBER	X	=LEAK
NLF	=NO LEAKS FOUND	(X)	=REPAIRED LEAK
NLFAR	=NO LEAKS FOUND AFTER REPAIR	*	=FILTER REPLACED

CERTIFICATION SERVICES



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DATE TESTED: NOVEMBER 30, 2006

TECHNICIAN(S): CARL SATHRUM

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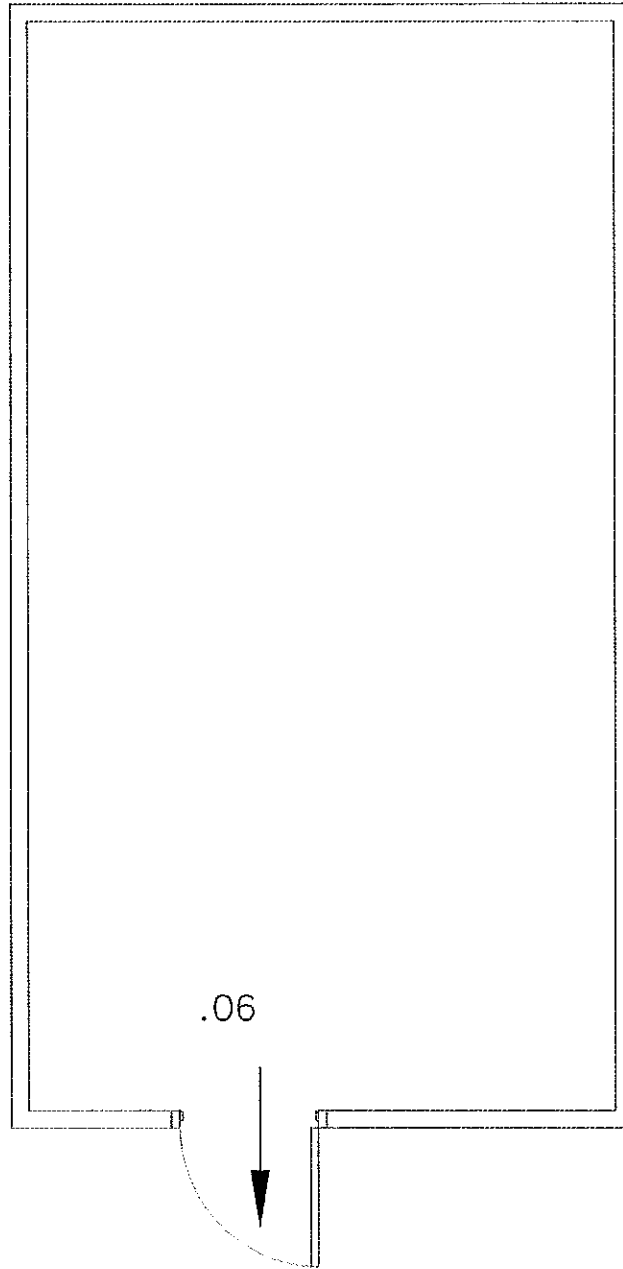
BURNSVILLE, MN 55337  
PHONE: (952) 960-4400  
FAX: (952) 960-4410

-- DRAWING NOT TO SCALE --

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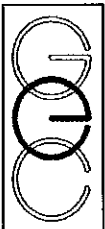
# PRESSURE DIFFERENTIALS



LEGEND

← = DIRECTION OF AIRFLOW  
.04" = PRESSURE DIFF. IN W.G.

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BURNSVILLE, MN 55337  
PHONE: (952) 960-4400  
FAX: (952) 960-4410

DATE TESTED: NOVEMBER 30, 2006

TECHNICIAN(S): CARL SATHRUM

-- DRAWING NOT TO SCALE --

GERBIG LAB

1178 East Cliff Road  
Burnsville, MN 55337



# Certificate of Calibration

*Manufacturer* SHORTRIDGE INSTR.  
*Model Number* ADM-870  
*Serial Number* M95039  
*Instrument Id* GEC-013-1  
*Instrument Type* AIRDATA MULTIMETER ADM-870  
*Company Name* GERBIG ENGINEERING CO  
*Customer Name* MICHAEL TURNURE  
*Cal Date* 07/26/2006  
*Next Cal Date* 07/26/2007  
*Cal Procedure* 400907  
*Cert Number* 1000054250  
*Recv In Tolerance* Y

CalMetrics certifies that at the time of calibration the above listed equipment meets or exceeds all published specifications.

At planned intervals, CalMetrics's measurement standards are calibrated to standards traceable to the National Institute of Standards (NIST) or derived from accepted values of physical constants.

Supporting documentation relative to traceability is on file and is available upon request.

Cal Std	Model Number	Instrument Type	Serial Number	Cal Date	Cal Due
C-10515-1	6220	DIGITAL PRESSURE GAUGE	45440	06/08/2006	06/08/2007
E-20033	1521	DIGITAL THERMOMETER	A4A545	10/27/2005	10/27/2006
E-20034	5627	RTD PROBE	732847	10/27/2005	10/27/2006
E-12370-0	1430	MANOMETER STANDARD 2	M7D	04/24/2006	04/24/2007
C-11895-1	8390	WIND TUNNEL		11/14/2005	11/14/2006

Lab Temperature 70.0  
 Lab Humidity 42.0

Metrologist:

*James W Couray*

CalMetrics Inc.  
 899 3rd Street S.W.  
 New Brighton, MN 55112  
 (800) 593-3182

07/26/2006

11:11:52

Page 1 of 1

This certificate shall not be reproduced except in full, without written approval of CalMetrics Inc.



## Equipment Certification & Calibration Report

Customer: Gerbig Engineering Company  
Address: 1178 East Cliff Road  
Burnsville, MN 55337

Customer P.O.#: Verbal  
Contact Name: Kurt Joly  
Phone No.: 952-960-4416  
Account Number: 2243

Instrument Type: Aerosol Photometer  
Manufacturer: TCL  
Model: BC700  
Serial #: 2881  
Additional Id #: N/A *GEL-015*

Date: 09/08/06

Item:	As-Found Readings:	Tolerance on as-Found Readings:	Note
Lamp voltage	5.10	5.10 ± .25 vdc	I
Amplifier +	15.06	15.06 ± .25 vdc	I
Voltages -	15.28	15.28 ± .25 vdc	I
Air Flow	1.10	1.0 ± .1 cfm	I

Final Readings after adjustments:	Tolerance on final readings:
5.10	5.10 ± .25 vdc
15.06	15.06 ± .25 vdc
15.28	15.28 ± .25 vdc
1.10	1.0 ± .1 cfm

### Linear Calibration:

Item:	As-Found Readings:	Tolerance on As-Found Readings:	Note
Stray light	.0054	< .050	I
100%	1.01 × 10 <sup>-5</sup>	1.0 ± .05 × 10 <sup>-5</sup>	I
10%	1.01 × 10 <sup>-6</sup>	1.0 ± .05 × 10 <sup>-6</sup>	I
1.0%	1.01 × 10 <sup>-7</sup>	1.0 ± .05 × 10 <sup>-7</sup>	I
0.1%	1.01 × 10 <sup>-8</sup>	1.0 ± .05 × 10 <sup>-8</sup>	I
0.01%	1.01 × 10 <sup>-9</sup>	1.0 ± .05 × 10 <sup>-9</sup>	I
Int. Ref.	10.9%	10% ± 1.0%	I

Final Reading after adjustments:	Tolerance on final readings:
.0054	< .050
1.01 × 10 <sup>-5</sup>	1.0 ± .05 × 10 <sup>-5</sup>
1.00 × 10 <sup>-6</sup>	1.0 ± .05 × 10 <sup>-6</sup>
1.00 × 10 <sup>-7</sup>	1.0 ± .05 × 10 <sup>-7</sup>
1.01 × 10 <sup>-8</sup>	1.0 ± .05 × 10 <sup>-8</sup>
1.02 × 10 <sup>-9</sup>	1.0 ± .05 × 10 <sup>-9</sup>
10%	10% ± 1.0%

### Logarithmic Calibration:

Item:	As-Found Readings:	Tolerance on As-Found Readings *	Note
100 µg/L	5.0	5.0 ± .2	I
20 µg/L	4.6	4.6 ± .2	I
Pt.1	1.05	1.0 ± .2	I
Pt.2	2.0	2.0 ± .2	I
Pt.3	3.0	3.0 ± .2	I

Final Readings After adjustments:	Tolerance on final readings:
5.0	± .2
4.6	± .2
1.0	± .2
2.0	± .2
3.0	± .2

\* values are taken from previous calibration report's final readings.

<b>Note values:</b>	( I ) in-tolerance when received	( N ) Not operable when received
	( O ) Out of tolerance when received	( N/A ) Not Applicable

Calibrated to:	DOP:	PAO: X	Other:
----------------	------	--------	--------

Instrument Type: Aerosol Photometer  
 Manufacturer: TCL  
 Model: BC700  
 Serial #: 2881  
 Additional Id #: N/A

Date: 09/08/06

**Maintenance performed:**

X	Measure voltages		Replace ref. filter		Clean solenoids		Clean Chamber
X	Ground check		Rep. exhaust filter	X	Leak test solenoids		Realign Chamber
X	Probe check		Clean in-line filter		Flush hoses & pump	X	Leak test chamber
X	Flow test						Replace lamp

**Other work performed:**

1. Repaired Probe
2. Replaced Missing In-line filter
3. Calibrated
- 4.
- 5.

Calibration Date: 09/08/06  
 Calibration Due Date: 09/08/07

Calibration performed by  
 TCL Instrument Technician: *AL RA*  
 Verified By: *Keith S. Thompson*

Calibrated per Institute of Environmental Sciences IES-CC-RP-013, and TCL's procedure(s):  
 Unless otherwise noted the Test Accuracy Ratio for each measurement point is at least 4:1

<input type="checkbox"/>	CALP003	<input type="checkbox"/>	CALP007	<input type="checkbox"/>	CALP012	<input type="checkbox"/>	CALP016
<input type="checkbox"/>	CALP004	<input type="checkbox"/>	CALP009	<input type="checkbox"/>	CALP013	<input type="checkbox"/>	
X	CALP005	<input type="checkbox"/>	CALP010	<input type="checkbox"/>	CALP014	<input type="checkbox"/>	
<input type="checkbox"/>	CALP006	<input type="checkbox"/>	CALP011	<input type="checkbox"/>	CALP015	<input type="checkbox"/>	

	Equipment Used:	NBS/NIST Traceable Date	Calibration Documents	Date Due for Recalibration
1.	Brooks Flow Meter Model # 1114DG51CNAAR Serial # 0103070239147/001	11/07/05	C-687, E-TD71, G-425	11/07/06
2.	Fluke Meter Model # 8050A Serial # 5365025	06/17/06	TS-0091	06/17/07
3.	Keithly Picoampere Source Model # 261 Serial # 524378	02/07/06	HS-0056, HS-0172, HS-0191	02/07/07



**U L T R A**  
ANALYTICS

**Certificate of Calibration**

SOWO Number : 2004159 Date Calibrated : December 3, 2005  
 Model : 237B CalDue : December 3, 2006  
 Serial Number : 051200011 Sensor Number : 54668

Calibration has been accomplished by size calibration as defined by ASTM F328-98 and JIS 9921 B-1997. The accuracy of the standards and equipment used in the calibration are traceable to the National Institute of Standards and Technology and unless otherwise noted, the accuracy ratios are equal to or greater than 4:1. A record of all work performed is maintained by Hach Ultra Analytics. All work performed is in accordance with Hach Ultra Analytics Quality Manual QA1001. Hach Ultra Analytics is compliant to ANSI Z540-1, MIL-STD 45662A and FTSCPAC CCA "7PI".  
 Reproduction of this Certificate except in full is strictly forbidden without the written permission of Hach Ultra Analytics

Channel 1 : Meets or exceeds Manufactures Specification of 20%  
 Channel > 1 : Meets or exceeds Manufactures Specification of 10%

Calibration Performed By Hach Ultra Analytics

Calibration was under the following controlled conditions :

Flow Rate : 0.10 SCFM Temperature : 23 Deg. C RH : 25 %

**Threshold Voltages**

0.30  $\mu$ m : 37.8mV 0.50  $\mu$ m : 268.2mV 1.00  $\mu$ m : 645.8mV 5.00  $\mu$ m : 1,444.1mV  
 10.00  $\mu$ m : 3,372.4mV

**Calibration Spheres**

Size : 5.010 Part No : 992019-1 Lot No : 27372 Exp : 11/1/2007 Size : 0.499 Part No : 992018-1 Lot No : 27239 Exp : 9/1/2007  
 Size : 0.299 Part No : 992005 Lot No : 27243 Exp : 10/1/2007 Size : 9.964 Part No : 992090 Lot No : 27734 Exp : 1/1/2008  
 Size : 1.020 Part No : 992011 Lot No : 26889 Exp : 7/1/2007

Calibration Procedure : CO2082815-11 Station : PortableCellCal  
 Oscilloscope ID : MET0121 Cal Due : August 15, 2006  
 MCA ID : MET0462 Cal Due : January 12, 2006  
 FlowMeter ID : MET0579 Cal Due : May 10, 2006  
 DMM ID : MET0037 Cal Due : April 19, 2006

Signed : Cheryl Soudm Title : Cal Tech  
 Signed : W. Stanton Title : QA